On writing and the Causal Assertion Paper

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Writing well is not easy[1]. In part that is because we write for so many purposes. Let me simplify our task by explaining our goal in writing the Causal Assertion Paper: *to clearly, concisely, evaluate the evidence so as to argue about the relative support for the causal assertion.*

That's a lot, so let's take it in steps.

[1] See, for instance, your own experience or ask pretty much anyone.

Clearly

By clarity I mean the clearness, intelligibility, comprehensibility, plainness, and precision of your writing. I need to pick up what you're putting down. Having read a lot of student papers in the form of the CAP, I have seem two general categories of problems with clarity, which I might charitably call, "I know what I mean…" and "I will science (jargon) the $hit out of this." Both make the reader work hard to understand and neither improves clarity.

The problem with the first of these is that while you might know what you mean, I cannot follow along. Often this comes from a lack of care or thought about the reader's perspective. Sometimes a sentence starts heading in one direction and then we are talking about ghosts. Sometimes ideas are repeated, but not always sequentially. Sometimes a sentences introduces a cool idea but never. Fragments are. Sometimes a person tries to connect multiple distinct ideas with a comma, I'm confused when it looks like a list but isn't. Sometimes a person repeats their ideas, making me wonder if there is some distinction I missed.

Often the relationship between ideas is just muddled, as if you are casually pointing out two people at a party and saying they are related. But I don't know these people, I don't know what "related" means, precisely (siblings? significant others? both members of the Fraternal Order of Moose?), and I'm not sure why it is you're telling me this. I need context and guidance. I need structure. Even the order in which the ideas are presented generates structure, so if you give me a scatter shot of ideas, that's how they'll be arranged in my mind; all over the place!

Imagine you're explaining something complicated to a a seven year old with a short attention span. Then clarify it further. Remember, you are not your audience; *I am*. You are not writing to get your ideas on paper for your own purposes (those are called notes), you are writing to convey ideas and understanding. So **keep your audience in mind**. *Guide* the reader through comparisons (e.g., "The response was five-fold greater in the treatment group than the controls"), highlight the relationships between ideas or studies (e.g., "While x found this, y found the opposite" or "Similarly, …" or "In contrast, …"), and provide a clear structure (e.g., introduce ideas from small to large, first to last, or similar).

The second problem is sort of the opposite of the first, but leads to similar

issues with clarity. I think some people think something along the lines of, "Cool! I've got a scientist for a reader, I've read these scientific papers, now it's time to write *Science*!" One issue is that this leads to unexplained jargon. Look, I'm a professor, but that doesn't mean I know all of the terms in all of these fields. Help a reader out! (Sometimes I am pretty sure you, the author, do not know what these words meant either… just because it sounds cool doesn't mean you should use it. Simpler is often better, even in science.)

Sometimes authors will imply mechanisms or assume I know about them, but. Again, I'm likely not an expert in your subject[2] so I need you to help me connect the dots. The extends to understanding what is and is not expected given a particular hypothesis. It may not be obvious to the reader or I might assume wrong, leading to all sorts of confusion[3]. Hold my hand and guide me through the logic. I promise I will not be offended if you explain even simple things.

Of course some students' papers combined elements of both categories[4]! In the end, it does not matter. The issues with clarity mean that I have a hard time understanding what you are trying to say, so your thinking might be admirable, but I might not be able to tell simply because I am confused by your writing.

[2] Full disclosure, I'm using you to help me learn about these topics!

[3] Ass, u, me, right?

[4] Going for the double! Well done!

Concisely

> *"Giving a lot of information clearly and in a few words; brief, but comprehensive."*
> —New Oxford American Dictionary

In essence, tow write concisely means to get rid of all of the crap that might cloud your point. Even strong logic and understanding can be hidden by a blizzard of extraneous words or details. Your job is to strip these away[5]. While it is not incorrect to write, "While comparing individuals in control and treatment groups in a study in 2002 Smith and colleagues found that those given a placebo had just as much of a reduction in self-reported test-taking anxiety than those given the new drug, relaxenol," that's quite a lot to process and keep in mind from start to finish. Could we not say this more succinctly, for instance as, "Smith et al. (2002) found that a placebo reduced self-reported test-taking anxiety as much as relaxenol," or even "Placebos were as effective as relaxenol in reducing test-taking anxiety (Smith et al. 2002)"? I prefer the second because who did the study is not particularly relevant, so relegating the authors to a parenthetical citation places the emphasis on the comparison of interest. The point of this word-jitsu is that our point is made clearer when we say it concisely; conciseness and clarity go hand-in-hand.

[5] Even if they sound "science-y"! See the *Clarity* section, above.

Writing concisely is not easy. Most of us have to go through drafts to get there. We start with our weedy, thicket of a paragraph and cut and refine until we get something that is much shorter and clearer. It takes practice, but there are two hallmarks of wordy or discursive writing you should look for. First, try finding the verb. If the action is towards the end of the sentence you are probably writing passively and that usually means more words and more work for the reader. Compare where the word, "found," is found in the first and second versions of the sentence

about the Smith et al paper in the prior paragraph. Which version sounds more active and authoritative? Which version sounds like the author knows what they are talking about? My advice is this: Write actively; put the verb up front.

Similarly, students often use words or phrases that seem to imply they are unwilling to commit to a statement or position. These are often called "weasel words," and there are lists of them[6]. I recommend scanning through these lists to get a sense of them and then looking carefully for these words in your own writing. Destroy them on sight. If you find yourself tempted to use a weasel word or phrase, stop yourself and ask what it is you are really trying to say. Usually passive and weaselly writing signals that you are uncertain of what you mean. Remedy the lack of understanding rather than wrapping it in a torrent of words[7].

[6] See https://en.wikipedia.org/wiki/Weasel_word

[7] Trust me: I'm pretty good at spotting what you do and do not understand!

Evaluate and argue

The CAP is all about evaluating evidence and deciding where you come down on the causal assertion based on that evidence. This means you must be an integral part of the process. Papers go wrong when the author has done their best to remove themselves from equation[8]. They are just plain awful when they simply rehash what other papers have found[9]. They excel when the author has a point of view or stance. You will find that clarity and conciseness become much easier if you know what you think.

To be clear, I am not implying that you write this paper in the first person (e.g., "I thought that Smith et al.'s study provided much stronger evidence than the initial study on relaxinol conducted by the manufacturer."), though there are worse things than that. You can be present with a point of view without writing "I thought" or similar (e.g., "The controlled experiment of Smith et al. (2002) strongly contrasts the smaller initial study of the manufacturer."). But either way you can see words evaluating and arguing rather than simply documenting.

[8] E.g., using weasel words to avoid committing to a statement.

[9] A list is not an argument.

A collection of thoughts, advice, pet peaves, and rants[10]

[10] Some repetitive of the above. I really mean them!

- **Papers and data do not conclude; authors do**. Studies do not aim or set out or examine, the authors do, but they might show or illustrate or demonstrate something or other.
- **Neither papers nor authors PROVE OR DISPROVE anything**. Proofs are for mathematicians, not for us lowly scientists. Our conclusions are always, always tentative. Including the law of (universal) gravitation[11]. Instead, talk about the weight of evidence for or against an assertion.
- **Finish your comparisons**. If you wrote, for instance, that "Gold doubloons make better bait for Leprechauns," your reader is likely screaming (silently, ineffectually), *Than what?! Gold bullion? Chocolate? Lucky charms?* It might be obvious to you, but the reader is, thankfully, not in your head.

[11] And just for completeness, No, Isaac Newton did not "prove" gravity exists, even setting aside the silly apple story. Of course gravity exists! The evidence of it is in and around us all the time, every day! No one doubted its existence. What Newton did was 1) write down some equations that make lovely predictions about its actions and 2) showed that these predictions worked just as well for planets as for stuff on Earth. But honestly, we still don't know what gravity is, exactly, or really even how it works. We just know its effects.

- **Be precise when possible**. Sometimes it is enough to say that most children get more candy at Halloween than Easter, but more often it is important to know how much more. One extra candy corn? Twice as much chocolate? And what's the unit of comparison anyway? Mass? Calories? How long it lasts? Be similarly precise about the logic or mode of action. Is the idea that since kids have some control over how many houses they "hit" while trick-or-treating their haul reflects the time available to them and their efficiency whereas during a typical Easter egg hunt there is a finite amount of candy that is then divided amongst the participants? Or is it that parents purchase less candy for their own kids during Easter than for the neighborhood during Halloween because they don't want to be viewed as stingy? These are obviously very different mechanisms that might lead to the same pattern.

- **Use connecting or comparing words to provide guidance for the reader**. If you leave it to the reader to connect the dots, we probably will not. Also, even a tiny bit of guidance can avoid the staccato of a series of short declarative sentences. For instance, how could you rewrite this? "Smith et al. (1995) found a large tentacle on the short. Victor and Vector (2001) argued it was not actually a tentacle. The isotopic signature was inconsistent with a predator's diet (Rolf et al. 1999)." Wouldn't a "however" and maybe a "moreover" or "indeed" or some such transition sort of word help?

- **Avoid extraneous words and casual phrases that add nothing**. For instance, a sentence like, "The authors looked into the validity of Cthulhu by using submersible drones to look for it in the ocean, but came back empty handed" you would be clearer, more direct, and a bit shorter as, "They did not find Cthulhu in 800 hours of searching with submersibles in the Atlantic." (Honestly, I might freak out if I have to read "look" at/into/for again. I mean, I would assume they were "looking into" the topic since you're citing them. Instead, what are they doing or finding? How are they "looking" into it? And more importantly, what did they find?)

- **Avoid weasel words**. If you find yourself trying to qualify or soften your statement, that is a good time to step back and ask yourself what it is, exactly, you are trying to say. Perhaps your subconscious use of weasel words or dread of saying something directly comes from a lack of understanding? Almost always your writing would be improved by removing these words and phrases. In any case, here are some types of weasel words from Wikipedia:

  1. Numerically vague expressions (for example, "some people", "experts", "many", "evidence suggests")
  2. Use of the passive voice to avoid specifying an authority (for example, "it is said")
  3. Adverbs that weaken (for example, "often", "probably")

- **Words and phrases to avoid**

  - Feel. I do not care how you "feel"[12]! I care how you weigh evidence, think through logic, and so on.
  - Prove/disprove. See above.
  - It or that, unless it is very, very clear what you are referring to.
  - Adaptation, unless you mean the evolutionary process. Same with evolve.
  - Any that imply values (i.e., good or bad)
  - Any that imply goals or intentions of animals (e.g., "Cthulhu wants to ensure its survival.") This is even worse when one talks of species trying to ensure their persistence. Just walk away from these assertions!
  - Contractions. They smack of informal writing. Sure, I use them in these conversational readings, but I would never do so in a paper intended for publication. Treat your CAP as if it will be published.

- **Spell out numbers** between zero and ten, and then use numerals for 11 and above[13]. The exception is a measurement or count data, in which case you should use numerals for all of numbers.

[12] Well, as a person, sure, but not in these papers.

[13] This *is* a stylistic thing, and you will see some journal prefer to use numerals all the time. But for my class, please follow my style guide!